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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/816,169	04/02/2004	Marcel Mathijs Theodore Marie Dierichs	081468-0309086	7876
909 7590 02/25/2008 PILLSBURY WINTHROP SHAW PITTMAN, LLP P.O. BOX 10500 MCLEAN, VA 22102				
EXAMINER				
CHACKO DAVIS, DABORAH				
ART UNIT		PAPER NUMBER		
1795				
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary**Application No.**

10/816,169

Applicant(s)DIERICH, MARCEL MATHIJS
THEODORE MARIE**Examiner**

DABORAH CHACKO DAVIS

Art Unit

1795

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 November 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-6, 8-25, 27-44 and 46-57 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6, 8-25, 27-44, 46-57 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-6, 8-13, 15-25, 27-32, 34-38, are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent No. 5,902,705 (Okamoto et al., hereinafter referred to as Okamoto) in view of U. S. Patent No. 6,583,068 (Yan et al., hereinafter referred to as Yan) and U. S. Patent Application Publication No. 2003/0147058 (Murakami et al., hereinafter referred to as Murakami).

Okamoto, in col 5, lines 53-67, in col 7, lines 4-22, in col 9, lines 1-42, in col 17, lines 1-67, in col 18, lines 4-67, in col 31, lines 33-38, in figure 1, discloses a lithographic apparatus comprising an illumination system that provides a projection beam of radiation (reference 2), a mask mount (support structure) that supports the mask (patterning device), wherein the mask imparts the pattern to the projected beam of light (radiation), a wafer suction mount (substrate table) that holds that wafer (substrate), a projection system that projects the patterned beam onto the wafer (projection lens, reference 49 of figure 37), wherein the mask includes a shielding material layer (absorber layer) and includes means to correct aberrations (aberration correction means, minimize formation of aberrations in the patterned beam) (claims 1, and 20). Okamoto, in col 9, lines 1-42, in col 31, lines 21-52, discloses that the

projection lens comprises reflecting means (lenses, mirrors etc are reflecting and refracting means) (claims 17, and 36).

The difference between the claims and Okamoto is that Okamoto does not disclose that the patterning structure comprises an aluminum absorber layer of the claimed thickness with a protective top coating. Okamoto does not disclose that the aluminum forms a substantially flat surface (claims 2, 21). Okamoto does not disclose that the aluminum has a substantially constant thickness (claims 3, 22). Okamoto does not disclose that the aluminum has thickness of about 50nm to about 200nm (claims 4, 23). Okamoto does not disclose that the aluminum has a thickness of about 70nm (claims 5, 24). Okamoto does not disclose that the protective top coating is selected from the group recited in claims 6, and 25. Okamoto does not disclose a protective coating of the claimed thickness (about 1nm) (claims 8, and 27). Okamoto does not disclose that the patterning structure comprises a bottom substrate material with a low coefficient of thermal expansion (claims 9, 28). Okamoto does not disclose a series of alternating layers of high index refraction material and low index refraction material beneath the aluminum layer (claims 10, 29). Okamoto does not disclose that the alternating layers of low index and high index material comprise 20 to about 80 layers (claims 11, 30). Okamoto does not disclose the claimed combinations of high index and low index refraction material recited in claims 12, and 31. Okamoto does not disclose that the high and low index refraction material layers have the claimed thickness recited in claims 13, and 32. Okamoto does not disclose that the patterning structure comprises a silicon dioxide buffer layer (claims 15-16, and 34-35). Okamoto does not

disclose that the radiation in the claimed wavelength (EUV wavelength, 5-20nm) is used as the illumination light (claims 18-19, and 37-38).

Yan, in col 2, lines 18-65, in col 3, lines 4-26, and in figure 1(e), discloses that the patterning structure (mask) comprises a glass-ceramic material layer (substrate material) of low coefficient of thermal expansion, a multilayer mirror of alternating layers of high index and low index material, a buffer layer, an aluminum absorber layer, and a top protective layer. Yan, in col 3, lines 4-14, and in figure 1(d), discloses a substantially flat aluminum absorber layer (reference 1400), that may be formed of a thickness of about 45 to 215nm (substantially constant). Yan, in col 3, lines 5-16, and lines 33-36, and lines 42-52, discloses that top layer is formed by treating the absorber layer (aluminum) with a plasma of oxygen, nitrogen etc (resulting in the formation of a corresponding oxide or nitride). Yan, in col 3, lines 24-26, discloses that the protective top layer is thinner than the absorber layer and may be about 20 nm. Yan, in col 2, lines 18-47, and in col 3, lines 4-6, discloses that a multilayer mirror (prior to absorber layer formation, beneath the absorber layer, see figures 1(b) through 1(d)) of about 20-80 pairs of alternating layers of high refractive index material (Mo) and low refractive index material (Si) that have a thickness of about 2.8nm and 4.1nm respectively. Yan, in col 2, lines 18-26, and lines 60-65, and figures 1(b) through 1(c) discloses that the patterning structure (mask) includes a buffer layer that may be formed of silicon dioxide. Yan in col 1, lines 6-39, discloses that the lithography can be performed in the claimed wavelength range (EUV range of 5-20nm).

The difference between the claims and Yan is that Yan does not disclose that the protective top coating has a thickness of about 0.1 to 5nm. Yan does not disclose that the protective top coating has a thickness of about 1nm .

Murakami, in [0083], [0088], and in [0094], discloses that the protective top coating can grow to a thickness of 2nm on the absorbing-body layer (absorber layer).

Therefore, it would be obvious to a skilled artisan to modify Okamoto by employing the mask structure taught by Yan because Yan, in the abstract, in col 2, lines 14-16, discloses that using the claimed mask enables the use of the mask with high contrast (between the absorber region and the mirror region) at the inspection wavelength (EUV wavelengths). It would be obvious to a skilled artisan to modify Okamoto in view of Yan by employing the claimed thickness of the protective layer of the multi-layer film mirror stack as suggested by Murakami because Murakami, in [0056], discloses that the formation of the protective layer (in the claimed thickness upto 2nm i.e., about 1nm) on the absorbing body layer completes the formation of the multilayer-film mirror and in [0036], and [0037], discloses that the protective layer prevents the accumulation of contaminants on the EUV reflective reticle.

3. Claims 14, and 33, are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent No. 5,902,705 (Okamoto et al., hereinafter referred to as Okamoto) in view of U. S. Patent No. 6,583,068 (Yan et al., hereinafter referred to as Yan) and U. S. Patent Application Publication No. 2003/0147058 (Murakami et al., hereinafter referred to as Murakami).as applied to claims 1-13, 15-32, 34-38, and 58-62, above, and further

in view of U. S. Patent Application Publication No. 2005/0040413 (Takahashi et al., herein after referred to as Takahashi).

Okamoto in view of Yan and Murakami is discussed in paragraph no. 2.

The difference between the claims and Okamoto in view of Yan and Murakami is that Okamoto in view of Yan and Murakami does not disclose a barrier layer between the high and low index refraction material layer (claim 14, and 33).

Takahashi, [1102], discloses an intermediate layer is interposed between the high refractive index layer and the low refractive index layer.

Therefore, it would be obvious to a skilled artisan to modify Okamoto in view of Yan by employing the method of incorporating a barrier layer between the high index layer and the low index layer as taught by Takahashi because Takahashi, [1102], discloses that doing so reduces the resistance of the multilayer reflector.

4. Claims 39-44, 46-51, and 53-57, are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent No. 6,583,068 (Yan et al., hereinafter referred to as Yan) in view of U. S. Patent Application Publication No. 2003/0147058 (Murakami et al., hereinafter referred to as Murakami).

Yan, in col 2, lines 18-65, in col 3, lines 4-26, and in figure 1(e), discloses a patterning structure (mask) that can be used in lithography comprising a glass-ceramic material layer (substrate material) of low coefficient of thermal expansion, a multilayer mirror of alternating high index and low index material, a buffer layer, an aluminum absorber layer, and a very thin top protective layer, wherein the absorber layer imparts

the pattern to the beam of projected radiation (part of a mask structure) (claims 39, 47, and 55). Yan, in col 3, lines 4-14, and in figure 1(d), discloses a substantially flat aluminum absorber layer (reference 1400), that may be formed of a thickness of about 45 to 215nm (substantially constant) (claims 40-42). Yan, in col 3, lines 5-16, and lines 33-36, and lines 42-52, discloses that top layer is formed by treating the absorber layer (aluminum) with a plasma of oxygen, nitrogen etc (resulting in the formation of a corresponding oxide or nitride) (claim 44). Yan, in col 3, lines 24-26, discloses that the protective top layer is thinner than the absorber layer and may be about 20 nm. Yan, in col 2, lines 18-47, and in col 3, lines 4-6, discloses that a multilayer mirror (prior to absorber layer formation, beneath the absorber layer, see figures 1(b) through 1(d)) of about 20-80 pairs of alternating layers of high refractive index material (Mo) and low refractive index material (Si) that have a thickness of about 2.8nm and 4.1nm respectively (claims 48-51). Yan, in col 2, lines 18-26, and lines 60-65, and figures 1(b) through 1(c) discloses that the patterning structure (mask) includes a buffer layer that may be formed of silicon dioxide (claims 53-54). Yan, in col 4, lines 4-26, and in figures 1(e) through 2(a) discloses that the a photoresist layer (radiation-sensitive layer, reference 1600) is formed on the protective top layer (reference 1500), and is then exposed, and developed to form a patterned photoresist which is then subject to reactive ion-etching to etch to form a pattern in the layers beneath (claims 56-57).

The difference between the claims and Yan is that Yan does not disclose that the protective top coating has a thickness of about 0.1 to 5nm. Yan does not disclose that the protective top coating has thickness of about 1nm (claim 46).

Murakami, in [0083], [0088], and in [0094], discloses that the protective top coating can grow to a thickness of 2nm on the absorbing-body layer (absorber layer).

Therefore, it would be obvious to a skilled artisan to modify Yan by employing the claimed thickness of the protective layer of the multi-layer film mirror stack as suggested by Murakami because Murakami, in [0056], discloses that the formation of the protective layer (in the claimed thickness upto 2nm i.e., about 1nm) on the absorbing body layer completes the formation of the multilayer-film mirror and in [0036], and [0037], discloses that the protective layer prevents the accumulation of contaminants on the EUV reflective reticle.

5. Claim 52 is rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent No. 6,583,068 (Yan et al., hereinafter referred to as Yan) in view of U. S. Patent Application Publication No. 2003/0147058 (Murakami et al., hereinafter referred to as Murakami) as applied to claims 49-44, 46-51, and 53-57, above and further in view of U. S. Patent Application Publication No. 2005/0040413 (Takahashi et al., herein after referred to as Takahashi).

Yan in view of Murakami is discussed in paragraph no. 4.

The difference between the claim and Yan in view of Murakami is that Yan in view of Murakami does not disclose a barrier layer between the high and low index refraction material layer (claim 52).

Takahashi, [1102], discloses an intermediate layer is interposed between the high refractive index layer and the low refractive index layer.

Therefore, it would be obvious to a skilled artisan to modify Yan in view of Murakami by employing the method of incorporating a barrier layer between the high index layer and the low index layer as taught by Takahashi because Takahashi, [1102], discloses that doing so reduces the resistance of the multilayer reflector.

Response to Arguments

6. Applicant's arguments, filed November 27, 2007, have been fully considered but they are not persuasive. The 103 rejections of Okamoto et al., and Yan et al., made in the previous office action (paper no. 20070823) are maintained.

A) Applicants argue that Yan's top layer and the protective coating of Murakami are different and that Yan requires a top layer of a significant thickness far exceeding the claimed range.

Yan neither requires that the protective layer be significantly thick nor teaches a certain thickness limitation. Yan merely suggests that the protective layer (top layer) may be of a certain thickness (such as 20nm). Additionally, Murakami is depended upon for the claimed thickness. Yan's top layer and Murakami's protective layer are not different because Murakami teaches forming a protective layer over the absorbing-body layer i.e., the absorber layer that covers a multilayer film stack, and that the multilayer film stack can be a patterning structure (reticle); and Yan forms a top layer (protective layer) on the absorber layer. Murakami's (see paragraph nos. [0056], and [0057]) suggested protective layer thickness is for the completion of a multi-layer mirror, and not for changing or adversely effecting underlying layer properties.

B) Applicants argue that Yan's top layer is designed to have higher absorbance and/or lower reflectivity than the absorber layer, and is in contradiction to that of Murakami, wherein Murakami's protective layer imparts no reflectivity decrease to the optical element.

Yan's top layer (i.e., protective layer of Yan), only in certain embodiments (see col 3, lines 27-32), may have higher absorbance and/or lower reflectivity than the underlying absorbance layer. Murakami does not compare the protective layer properties (absorption and/or reflectivity) with that of the absorber layer; Murakami (in [0022])) compares the optical properties of its protective layer to that of its first layer of the multilayer mirror, not the underlying absorber layer. This is not the comparison disclosed in Yan. Murakami does not suggest or teach an optical property comparison of the protective layer with the underlying absorber layer. Therefore, the teaching of Murakami, wherein a very thin protective layer is formed on the absorber layer, is not at all contradicting to the teaching of Yan et al.

C) Applicants argue that Murakami disclose an absorbing layer of material other than aluminum and that Murakami does not anticipate or render obvious the thickness of the claimed protective top coating.

Murakami is not depended upon to disclose the claimed protective layer or the claimed aluminum absorber layer. Yan teaches an aluminum absorber layer and a protective layer that performs the same function as that claimed. Murakami is only relied upon to disclose the claimed protective layer thickness employed on a multilayer

film stack wherein Murakami teaches that the multilayer film stack can be the claimed patterning structure i.e., a reticle.

Conclusion

7. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daborah Chacko-Davis whose telephone number is (571) 272-1380. The examiner can normally be reached on M-F 9:30 - 6:00. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark F Huff can be reached on (571) 272-1385. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published

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applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/John A. McPherson/
Primary Examiner, Art Unit 1795

dcd

February 19, 2008.

Application Number**Application/Control No.**

10/816,169

**Applicant(s)/Patent under
Reexamination**DIERICH, MARCEL MATHIJS
THEODORE MARIE**Examiner**

DABORAH CHACKO DAVIS

Art Unit

1795